SIEMENS

SOMATOM AR /Spiral

CT

DICOM Conformance Statement

Version B41A

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Manufacturer‘s note:

This product bears a CE marking in accordance with the provisions of directive 93/42/EEC of June 14th, 1993 for medical products.

The CE marking applies only to medico-technical products/medical products introduced in connection with the above-mentioned comprehensive EC directives.

Table of Contents

Introduction

A *DICOM Storage*

A.1 Implementation Model

A.2 Application Entity Specifications Storage AEs Specification

A.3 Communication Profiles

A.4 Extensions/Specializations/Privatizations

A.5 Configuration

A.6 Support of Extended Character Sets

A.7 SOMARIS/4 DICOM Header VB41

B *DICOM Query Retrieve*

B.1 Implementation Model

B.2 Application Entity Specifications Query/Retrieve Service AEs Specification

B.3 Communication Profiles

B.4 Extensions/Specializations/Privatizations

B.5 Configuration

B.6 Support of Extended Character Sets

C *DICOM Basic Print*

C.1 Implementation Model

C.2 Application Entity Specifications Print Management AEs Specification

C.3 Communication Profiles

C.4 Extensions/Specializations/Privatizations

C.5 Configuration

C.6 Support of Extended Character Sets

D *DICOM Work List*

D.1 Implementation Model

D.2 Application Entity Specifications
Modality Worklist Service AEs Specification

D.3 Communication Profiles

D.4 Extensions/Specializations/Privatizations

D.5 Configuration

D.6 Support of Extended Character Sets

Introduction

Purpose

DICOM (Digital Imaging and Communications in Medicine) is the industry standard for transferral of radiologic images and other medical information between computers. DICOM enables digital communication between diagnostic and therapeutic equipment and systems from various manufacturers.

This DICOM Conformance Statement describes the details of the implementation of the DICOM standard in the described product. It contains very detailed information about the implementation model (provided services, data flow, functional definitions), the application entity specification (number of connections, transfer syntax, supported formats etc.), and information about vendor specific (private) elements.

The conformance statement is typically used by networking experts to determine how systems of different vendors can be connected.

This DICOM Conformance Statement is written in accordance with to part PS 3.2 of [1].

The applications described in this conformance statement are the SIEMENS SOMATOM products using SOMARIS/4 software.

The SOMARIS/4 DICOM network implementation acts as:

Storage	SCU and SCP for the C-Store DICOM network service
Query/Retrieve	SCU and SCP for the DICOM Query/Retrieve network service
Basic Print	SCU for the DICOM Basic Print Management network service
Worklist	SCU for the DICOM Modality Worklist service

Scope

This DICOM Conformance Statement refers to SIEMENS SOMATOM products using SOMARIS/4 software. The following table relates SOMARIS/4 software names to SIEMENS SOMATOM products

Software Name	SIEMENS CT Product
SOMARIS/4 VB41 and subsequent	SOMATOM AR Star and SP

Definitions, Abbreviations

Definitions

DICOM: Digital Imaging and Communications in Medicine
DIMSE: DICOM Message Service Element
DIMSE-C: DICOM Message Service Element with Composite information objects

Abbreviations

ACR: American College of Radiology
AE: DICOM Application Entity
ASCII: American Standard Code for Information Interchange
DS: Decimal String (16 bytes maximum)
IOD: DICOM Information Object Definition
IS: Integer String (12 bytes maximum)
ISO: Internationl Standard Organisation
LO: Long String (12 bytes maximum)
NEMA: National Electrical Manufacturers Association
RIS: Radiology Information System
PDU: DICOM Protocol Data Unit
SCU: DICOM Service Class User (DICOM client)
SCP: DICOM Service Class Provider (DICOM server)
SH: Short String (16 characters maximum)
SOP: DICOM Service-Object Pair
ST: Short Text (1024 chararcters maximum)
UID: Unique IDentifier, string unique in the whole network
UL: Unsigned Long (4 bytes fixed)
US: Unsigned Short (2 bytes fixed)

References

[1]: Digital Imaging and Communications in Medicine
DICOM 3.0, PS 3.1–13–1996

Connectivity and Interoperability

The implementation of the Siemens DICOM interface has been carefully tested to ensure correspondence with this Conformance Statement. But the Conformance Statement and the DICOM standard do not guarantee interoperability between Siemens modalities and modalities of other vendors. The user must compare the relevant Conformance Statements and if a successful interconnection is to be implemented , the user is responsible to specify an appropriate test suite and for validating the interoperability required. A network environment may need additional functions outside the scope of DICOM.

PART A

DICOM Storage

A.1 *Implementation Model*

Application Data Flow Diagram A.1–2

Functional Definitions of Application Entities A.1–3

Sequencing of real World Activities A.1–4

A.2 *Application Entity Specifications Storage AEs Specification*

Association Establishment Policies A.2–2

- General A.2–2
- Number of Associations A.2–2
- Asynchronous Communication A.2–2
- Implementation Identifying Information A.2–2

Association Initiation Policy A.2–3

- Associated Real-World Activity A.2–3

Association Acceptance Policy A.2–5

- Associated Real-World Activity A.2–5
- Presentation Context Acceptance Criterion A.2–7
- Transfer Syntax Selection Policies A.2–7
- General Image Representation A.2–8
- Pixel Representation A.2–8

A.3 *Communication Profiles*

Supported Communication Stacks A.3–1

- OSI Stack A.3–1
- TCP/IP Stack A.3–1
- Point-to-Point Stack A.3–1

A.4 *Extensions/Specializations/Privatizations*

Standard Extended/Specialized/Private SOPs A.4–1

Private Transfer Syntaxes A.4–2

A.5 *Configuration*

AE Title / Presentation Address Mapping A.5–1

Configurable Parameters A.5–2

A.6 *Support of Extended Character Sets*

A.7 *SOMARIS/4 DICOM Header VB41*

CHAPTER A.1

Implementation Model

The SIEMENS CT DICOM Application Entity results in associations for Storage of DICOM Composite Information Objects in Remote Application Entities.

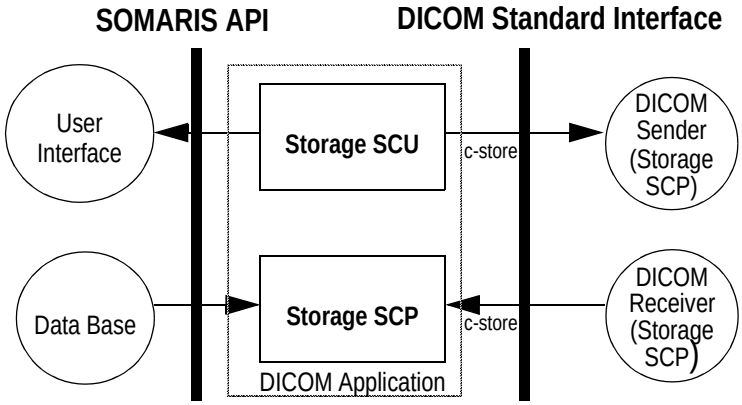
Application Data Flow Diagram

The SOMARIS DICOM network implementation is a UNIX application and acts as SCU and SCP for the C-Store DICOM network service. Storage SCU and Storage SCP handle the DICOM communication.

These applications are started automatically and will be invoked automatically via network.

Upon acceptance of the association by Storage SCP, the remote AE transmits the DICOM Information Objects to Storage SCP. Storage SCP receives each object and converts DICOM 3.0 into the ACR/NEMA format and finally to internal format.

Storage SCU initiates associations for DICOM Storage Service Class to remote AEs. For each folder a new association to the corresponding remote DICOM AE is initiated. The data sets are read in, converted to DICOM 3.0 Information Objects and sent via that open association.



Functional Definitions of Application Entities

All components of the SOMATOM DICOM implementation operate as background daemon processes. They exist as soon as the machine is switched on and await tasks.

Storage SCP acting as a SCP awaits for association requests from a remote DICOM client. The Application Entity Titles and the Port Number the SCP is monitoring are taken from the local configuration.

Storage SCU acting as a SCU processes orders from the copy processes (i.e. a new copy order arrives via user input and copy server). Upon such a request it initiates an association with a remote Application Entity.

Sequencing of real World Activities

not applicable

CHAPTER A.2

Application Entity Specifications

Storage AEs Specification

The CT service class user application provides one AE which is used when initiating associations to remote DICOM nodes.

SIEMENS CT products provide Standard Conformance to the following DICOM V3.0 SOP Classes as a SCU:

SOP Class Name	SOP Class UID
CT Image Information Object Storage	1.2.840.10008.5.1.4.1.1.2

The SIEMENS CT products provides Standard Conformance to the following DICOM V3.0 SOP Classes as a SCP:

SOP Class Name	SOP Class UID
CT Image Information Object Storage	1.2.840.10008.5.1.4.1.1.2
MR Image Information Object Storage	1.2.840.10008.5.1.4.1.1.4
SC (Secondary Capture) Image Information Object Storage	1.2.840.10008.5.1.4.1.1.7
Verification	1.2.840.10008.1.1

Association Establishment Policies

General

The configuration of the SIEMENS DICOM implementation defines the Application Entity Titles, the port numbers and of course the host name and net address.

Number of Associations

The SIEMENS SOMARIS DICOM application initiates one association at a time, one for each transfer request is processed.

Asynchronous Communication

This version of the SIEMENS DICOM toolkit software does not support asynchronous communication (multiple outstanding transactions over a single association).

Implementation Identifying Information

SIEMENS CT DICOM software provides a single Implementation Class UID of

- ❏ “1.3.12.2.1107.5.1.1”

and an Implementation Version Name of

- ❏ “SiemensSOM4_VB41”.

Association Initiation Policy

The SIEMENS CT DICOM application attempts to initiate a new association for

- DIMSE-C-STORE

service operations.

Associated Real-World Activity

Associated Real-World Activity – Send Image Objects to a remote Node

The associated Real-World activity is a C-Store request initiated by the internal daemon process Storage SCU. If Storage SCU successfully establishes an association to a remote Application Entity, it will convert and then transfer each image of that folder one after another via the open association. If the C-Store Response from the remote Application contains a status other than Success the association is aborted.

The DICOM targets are configured at configuration time.

Proposed Presentation Contexts

The SIEMENS CT DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended
Name	**UID**	**Name List**	**UID List**		**Negotiation**
CT Image Storage Service class	1.2.840.10008.5.1.4.1.1.2	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Big Endian Transfer Syntax,	1.2.840.10008.1.2.2		
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		

SOP Specific Conformance Statement

The DICOM images created by SIEMENS CT DICOM application conform to the DICOM IOD definitions (Standard extended IODs). But they will contain additional private elements which have to be discarded by a DICOM system when modifying the image.

The DICOM nodes are responsible for data consistency when modifying images. All unknown private attributes have to be removed upon modification!

Association Acceptance Policy

The SIEMENS CT DICOM application accepts a new association for

- ❏ DIMSE-C-ECHO
- ❏ DIMSE-C-STORE

service operations.

Associated Real-World Activity

Associated Real-World Activity - Receiving Image Objects from a remote Node

The Storage SCP will accept an association and will receive any images transmitted on that association and store the images on data base.

The DICOM nodes are configured at configuration time.

Proposed Presentation Contexts

The SIEMENS CT DICOM application will propose Presentation Contexts as shown in the following table.

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended
Name	**UID**	**Name List**	**UID List**		**Negotiation**
CT Image Storage Service class	1.2.840.10008.5.1.4.1.1.2	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Big Endian Transfer Syntax,	1.2.840.10008.1.2.2		
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
MR Image Storage Service class	1.2.840.10008.5.1.4.1.1.4	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Big Endian Transfer Syntax,	1.2.840.10008.1.2.2		
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
SC Image Storage Service class	1.2.840.10008.5.1.4.1.1.7	DICOM Implicit VR Little Endian Transfer Syntax,	1.2.840.10008.1.2	SCP	None
		DICOM Explicit VR Big Endian Transfer Syntax,	1.2.840.10008.1.2.2		
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		

SOP Specific Conformance Statement

The SIEMENS CT DICOM application conforms to the Full Storage Service Class at Level 0. In the event of a successful C-Store operation, the image has successfully been transferred

The CT DICOM Receiver "Storage SCP" returns the Success status upon successful operation, otherwise one of the following status codes is returned and the association aborted:

- Refused (A700):
  This error status indicates a lack of Resources on the CT modality.
- Error (A900 or C000):
  An error occurred while processing the image which makes it impossible to proceed. The image will not be stored and the association aborted.

Presentation Context Acceptance Criterion

The SIEMENS CT DICOM application will accept any number of verification or storage SOP classes that are listed above. There is no limit on the number of presentation contexts accepted. In the event that the SIEMENS CT DICOM application runs out of resources, it will reject the association request.

Transfer Syntax Selection Policies

The SIEMENS CT DICOM application currently only supports the Implicit VR Little Endian, the Explicit VR Little Endian and Explicit VR Big Endian transfer syntax. Any proposed presentation context which includes one of these transfer syntaxes will be accepted. Any proposed presentation context that does not include one of these transfer syntaxes will be rejected.

General Image Representation

The DICOM images created by SIEMENS CT DICOM conforms to the DICOM IOD definitions. But they will contain additional private elements which have to be discarded by a DICOM system when modifying the image. The DICOM nodes are responsible for data consistency when modifying images. All unknown private attributes have to be removed upon modification.

The details of the image definition is descriped in SOMARIS/4 Data Set Software

Pixel Representation

The SIEMENS CT DICOM application supports the unsigned 16 bit pixel gray scale and graphic overlay format. The lower 12 bits are used for pixel gray scale and the higher 4 bits are used for the graphic overlay:

- ❏ bits allocated (element 0028, 0100) = 16
- ❏ bits stored (element 0028,0101) = 12
- ❏ high bit (element 0028,0102) = 11
- ❏ pixel representation (element 0028,0103) = 0 - unsigned integer.

CHAPTER A.3

Communication Profiles

Supported Communication Stacks

SIEMENS CT products with software SOMARIS/4 provide DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

OSI Stack

not yet supported

TCP/IP Stack

The SIEMENS CT DICOM application uses the TCP/IP stack from the SUN-OS UNIX system upon which it executes. It uses a subroutine library that is based on a Berkeley socket interface.

API

The SIEMENS CT DICOM application uses a library that is based on a Berkeley socket interface.

Physical Media Support

The SIEMENS CT DICOM application is indifferent to the physical medium through which TCP/IP executes; it inherits this from the SUN-OS UNIX system upon which it executes.

Point-to-Point Stack

not supported

CHAPTER A.4

Extensions/Specializations/ Privatizations

Standard Extended/Specialized/ Private SOPs

The SIEMENS CT DICOM application creates DICOM standard extended Information Objects in such a way that each image can contain additional private elements stored in private groups. These elements are used to store data not defined in DICOM.

If these images are modified on DICOM nodes then these applications are responsible for data consistency. All unknown private attributes have to be removed upon modification!

Private Transfer Syntaxes

None

CHAPTER A.5

Configuration

AE Title / Presentation Address Mapping

The SIEMENS CT DICOM maps Application Entity Titles to host name and port number via an internal configuration method. The IP address for the host name is determined using standard Unix system calls.

For each DICOM unique Application Entity Titles are assigned using the following mechanism:

Each Application Entity Title starts with a unique 10 character string assigned for this DICOM toolkit node. An example for such a string is '049SA1CT39'.

SOMARIS/4 uses for DICOM Storage SCP:

- the DICOM Application Entity title: <AEroot>DIC1
- and the port number 50082

SOMARIS/4 DICOM Storage SCU provides:

- the DICOM Application Entity Title <AEroot>DFOS
- and the port number 50082

Configurable Parameters

The Application Entity Titles, host names and port numbers are configured using the Config Tool of SOMARIS/4.

This Install Tool also uses some default parameters:

- ❏ max PDU size set to 16384 Bytes (16 kB)
- ❏ time-out for accepting/rejecting an association request: 60s
- ❏ time-out for responding to an association open/close request: 60s
- ❏ time-out for accepting a message over network: 120s

CHAPTER A.6

Support of Extended Character Sets

SOMARIS/4 DICOM application supports the ISO 8859-1 character set.

CHAPTER A.7

SOMARIS/4 DICOM Header VB41

Attribute Name	Tag	length	special use
Specific Character Set	0008,0005		ISO IR 100
Image Type	0008,0008		Value 3 may be 'UNKNOWN'
SOP Class UID	0008,0016		
SOP Instance UID	0008,0018		
Study Date	0008,0020		releated to the day when the examination was registered
Acquisition Date	0008,0022		relelated to the day when the examination was performed
Image Date	0008,0023		related to the date when the image calculation was performed
Study Time	0008,0030		
Acquisition Time	0008,0032		related to the time when the acquisition was performed
Image Time	0008,0033		related to the time when the image calculation was performed
Data Set Type	0008,0040		'0' for images
Data Set Subtype	0008,0041		IMA * * = SOMARIS4 Image Type
Accession Number	0008,0050		'blank' if no RIS connection
Modality	0008,0060		CT
Manufacturer	0008,0070		SIEMENS
Institution Name	0008,0080		
Referring Physicians Name	0008,0090	25	as registered or RIS
Station Name	0008,1010		
Study Description	0008,1030	52	
Performing Physicians Name	0008,1050	25	as registered

Attribute Name	Tag	length	special use
Admitting Diagnoses Description	0008,1080	39	as registered
Manufacturers Model Name	0008,1090	25	SOMATOM AR STAR
Patients Name	0010,0010	25	
Patient ID	0010,0020	11	
Patients Birth Date	0010,0030	8	
Patients Sex	0010,0040		
Patients Age	0010,1010		
ContrastBolus Agent	0018,0010		
Body Part Examined	0018,0015		comply with organ choice
Scanning Sequence	0018,0020		n.a.
Slice Thickness	0018,0050		
KVP	0018,0060		
Data Collection Diameter	0018,0090		
Device Serial Number	0018,1000	26	
Software Versions	0018,1020	8	
Distance Source to Detector	0018,1110		
Distance Source to Patient	0018,1111		
GantryDetector Tilt	0018,1120		
Table Height	0018,1130		
Rotation Direction	0018,1140		
Exposure Time	0018,1150		
Xray Tube Current	0018,1151		

Attribute Name	Tag	length	special use
Exposure	0018,1152		
Generator Power	0018,1170		
Focal Spots	0018,1190		
Date of Last Calibration	0018,1200		
Time of Last Calibration	0018,1201		
Convolution Kernel	0018,1210	15	
Patient Position	0018,5100		
Study Instance UID	0020,000D		
Series Instance UID	0020,000E		
Study ID	0020,0010	6	numeric value
Series Number	0020,0011		
Acquisition Number	0020,0012		
Image Number	0020,0013		
Image Position	0020,0030		
Image Position Patient	0020,0032		
Image Orientation	0020,0035		
Image Orientation Patient	0020,0037		
Location	0020,0050		
Frame of Reference UID	0020,0052	47	
Image Geometry Type	0020,0070		
Masking Image	0020,0080		<null>
Position Reference Indicator	0020,1040		<null>
Slice Location	0020,1041		

Attribute Name	Tag	length	special use
Source Image ID	0020,3100	0	<null>
Modifying Device ID	0020,3401	0	<null>
Modified Image ID	0020,3402	0	<null>
Modified Image Date	0020,3403	0	<null>
Modifying Device Manufacturer	0020,3404	0	<null>
Modified Image Time	0020,3405	0	<null>
Modified Image Description	0020,3406	0	<null>
Image Comments	0020,4000	52	
Original Image Identification	0020,5000	0	<null>
Original Image Identification Nomenclature	0020,5002	0	<null>
Samples per Pixel	0028,0002		1
Photometric Interpretation	0028,0004	11	MONOCHROME2
Image Dimensions	0028,0005		
Rows	0028,0010		
Columns	0028,0011		
Pixel Spacing	0028,0030		
Image Format	0028,0040		RECT
Manipulated Image	0028,0050	0	<null>
Bits Allocated	0028,0100	2	16
Bits Stored	0028,0101	2	12
High Bit	0028,0102	2	11
Pixel Representation	0028,0103	2	0
Image Location	0028,0200		

Attribute Name	Tag	length	special use
Window Center	0028,1050		
Window Width	0028,1051		
Rescale Intercept	0028,1052		
Rescale Slope	0028,1053		
Requested Procedure ID	0040,1001		if patient registered by RIS
Pixel Data	7FE0,0010		OB, OW data

PART B

DICOM Query Retrieve

B.1 *Implementation Model*

Application Data Flow Diagram B.1–2

Functional Definitions of Application Entities B.1–4

Sequencing of real World Activities B.1–5

B.2 *Application Entity Specifications Query/Retrieve Service AEs Specification*

Association Establishment Policies B.2–3

General B.2–3

Number of Associations B.2–3

Asynchronous Nature B.2–3

Implementation Identifying Information B.2–3

Association Initiation Policy B.2–4

Real World Activity – Find SCU B.2–4

Real World Activity – Get SCU B.2–7

Real World Activity – Move SCU B.2–8

Association Acceptance Policy B.2–10

RealWorld Activity – Find SCP B.2–10

Real World Activity – Get SCP B.2–14

Real World Activity – Move SCP B.2–15

B.3 *Communication Profiles*

Supported Communication Stacks B.3–1

OSI Stack B.3–1

TCP/IP Stack B.3–1

Point-to-Point Stack B.3–1

B.4 *Extensions/Specializations/Privatizations*

Standard Extended/Specialized/Private SOPs B.4–1

Private Transfer Syntaxes B.4–2

SOMARIS/4 Specifics B.4–3
Attribute Matching B.4–4

B.5 *Configuration*

AE Title / Presentation Address Mapping B.5–2
Default Parameters B.5–3

B.6 *Support of Extended Character Sets*

CHAPTER B.1

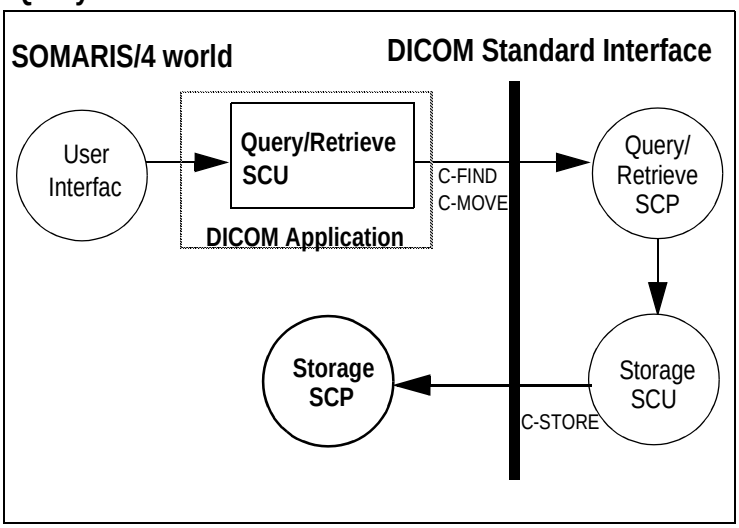
Implementation Model

The query/retrieve service class defines an application level class of services which facilitates the management of images and patient data incorporated within the well defined information model of DICOM and allows a DICOM AE to retrieve images from a remote DICOM node. The SOMARIS/4 DICOM query/retrieve application supports the query/retrieve services to act as SCU and SCP.

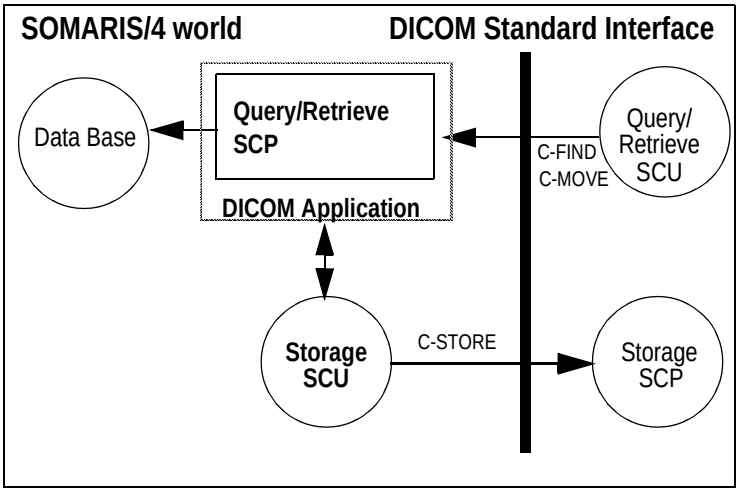
Application Data Flow Diagram

The SOMARIS/4 DICOM network implementation is a UNIX application and acts as SCU and SCP for the query/retrieve network service.

Query/Retrieve SCU



Query/Retrieve SCP



Functional Definitions of Application Entities

The query/retrieve SCU requests the query/retrieve SCP to perform a match to the keys specified in the request and a C-Move DIMSE service initiates a C-Store suboperation to transfer an image from a Storage SCU to a Storage SCP.

The query/retrieve SCP responses to C-Find DIMSE services and a C-Move involves the SIEMENS SOMATOM DICOM query/retrieve SCP application to initiate a C-Store suboperation to a Storage SCP.

All components of the SIEMENS SOMATOM DICOM query/retrieve SCP application operate as background daemon processes. They exist whenever the machine is switched on and respond to queries based on the records stored in its database.

Sequencing of real World Activities

not applicable

CHAPTER B.2

Application Entity Specifications

Query/Retrieve Service AEs Specification

The Query/Retrieve SCU request that the remote SCP performs a match of all keys specified in the request, against the information in its database and the identified images will be moved or retrieved to the same or a different storage association.

The Query/Retrieve SCP responds to queries based on the records on its database Images will be sent to the requesting SCU or to a different storage association.

SIEMENS SOMATOM DICOM products provide Standard Conformance to the following DICOM V3.0 SOP Classes as an SCU:

SOP Class Name	SOP Class UID
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2

SIEMENS SOMATOM DICOM products provide Standard Conformance to the following DICOM V3.0 SOP Classes as an SCP:

SOP Class Name	SOP Class UID
Patient Root Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.1.1
Patient Root Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.1.2
Patient/Study Only Query/Retrieve Information Model - FIND	1.2.840.10008.5.1.4.1.2.3.1
Patient/Study Only Query/Retrieve Information Model - MOVE	1.2.840.10008.5.1.4.1.2.3.2

NOTE

See also the Storage DICOM Conformance Statement of the SIEMENS SOMATOM DICOM application to check for conformance of the C-STORE sub-operation generated by the DIMSE service and compare also the Storage Service SOP classes described in the Storage DICOM Conformance Statement of the modality to which the images shall be transferred initiated by the C-MOVE DIMSE service.

Association Establishment Policies

General

The configuration of the SIEMENS SOMATOM DICOM query/ retrieve application defines the Application Entity Titles, the port numbers and of course the host name and net address.

Number of Associations

The SIEMENS SOMATOM DICOM application initiates one/ several association(s) at a time, one for each transfer request being processed.

Asynchronous Nature

The SIEMENS SOMATOM DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

Implementation Identifying Information

The SIEMENS SOMATOM DICOM software provides a single Implementation Class UID of

❏ “1.3.12.2.1107.5.1.1“

and an Implementation Version Name of

❏ “SiemensSOM4_VB41”.

Association Initiation Policy

The Query/Retrieve SCU and SCP establish an association by using the DICOM association services. During association establishment the Query/Retrieve application entities negotiates the supported SOP classes to exchange the capabilities of the SCU and the SCP.

The following DIMSE-C operations are supported as SCU:

- ❑ C-FIND
- ❑ C-MOVE

Real World Activity – Find SCU

Associated Real World Activity – Find SCU

The associated Real-World activity is to initate query request to a SCP with the query model Patient Root.

Proposed Presentation Contexts – Find SCU

The SIEMENS SOMATOM DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended
Name	**UID**	**Name List**	**UID List**		**Negotiation**
Patient Root Find	1.2.840.10008.5.1.4.1.2.3.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	See Note
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2		

NOTE

C-Find Extended Negotiation will be supported by the SCU.

SOP Specific Conformance Statement – Find SCU

The SIEMENS SOMATOM DICOM Query/Retrieve SCU supports hierarchical queries with all mandatory search keys. The following four tables describe the search keys for the four levels of query that the SCU supports.

For Find SCU wild card search is supported. The delimiter symbols 'space' and 'caret', 'comma' are replaced by 'questionmark'

Patient level attributes

Attribute name	Tag	Usage SCU/SCP	Note
Patient name	(0010,0010)	M/M	max. length 25
Patient id	(0010,0020)	M/M	max. length 12
Patient's Birth Date	(0010,0030)	U/U	
No.of Pat.Rel.Images	(0020,1204)	U/U	

Study level attributes

Attribute name	Tag	Usage SCU/SCP	Note
Study instance UID	(0020,000D)	M/M	
Study id	(0020,0010)	M/M	int. numeric representaion
Study date	(0008,0020)	M/M	
Study time	(0008,0030)	M/M	
Accession number	(0008,0050)	M/M	:= case id

Series level attributes			
Attribute name	**Tag**	**Usage SCU/SCP**	**Note**
Series instance UID	(0020,000E)	M/M	
Series number	(0020,0011)	M/M	:= 1
Modality	(0008,0060)	M/M	'CT'

Image level attributes			
Attribute name	**Tag**	**Usage SCU/SCP**	**Note**
SOP instance UID	(0008,0018)	M/M	
Image number	(0020,0013)	M/M	
Acquisition	(0020,0012)	U/U	
Acquisition Date	(0008,0022)	U/U	
Acquisition Time	(0008,0032)	U/U	
Slice Location	(0020,1041)	U/U	

The Find SCU interprets following status codes:

C-FIND response status

Service Status	Meaning	Protocol Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

Real World Activity – Get SCU

not applicable

Real World Activity – Move SCU

Associated Real-World Activity – Move SCU

The associated Real-World activity is to generate retrievels to a SCP using the C-MOVE operation with the query model Patient Root. The Storage Service Class Conformance Statement of the SCP must describe the C-STORE service which is generated by the C-Move service.

After C-STORE the images are copied to SOMARIS/4 data base and translated into internal format. Images get a new SOP Instance UID; Study Instance UID and Series UID will be kept unchanged.

It is not applicable to move images to a third modality.

Proposed Presentation Contexts – Move SCU

The SIEMENS SOMATOM DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended
Name	**UID**	**Name List**	**UID List**		**Negotiation**
Patient Root Query/ Retrieve Move	1.2.840.10008.5.1.4.1.2.1.2	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	See Note
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2		

NOTE

C-Move Extended Negotiation will be supported by the SCU.

SOP Specific Conformance Statement – Move SCU

At association establishment time the C-Move presentation context shall be negotiated. The C-Store sub-operations must be used on a different association to transfer images to another SCP of the Storage Service Class.

The Move SCU interprets following status codes:

C-move response status

Service Status	Meaning	Protocol Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform suboperations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
Failed	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures of Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

Association Acceptance Policy

The Query/Retrieve SCU and SCP establish an association by using the DICOM association services. During association establishment the Query/Retrieve application entities negotiates the supported SOP classes to exchange the capabilities of the SCU and the SCP.

The following DIMSE-C operations are supported as SCP:

- ❏ C-FIND
- ❏ C-MOVE

RealWorld Activity – Find SCP

Associated Real-World Activity – Find SCP

The associated Real-World activity is to respond to query requests to an SCU with the query model Patient Root and Patient/Study Only.

Proposed Presentation Contexts – Find SCP

The SIEMENS SOMATOM DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended
Name	**UID**	**Name List**	**UID List**		**Negotiation**
Patient Root Query/ Retrieve Find	1.2.840.10008.5.1.4.1.2.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCP	See Note
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2		
Patient/Study Only Query/ Retrieve Find	1.2.840.10008.5.1.4.1.2.3.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCP	See Note
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2		

NOTE

C-Find Extended Negotiation will be supported by the SCP.

SOP Specific Conformance Statement – Find SCP

The SIEMENS SOMATOM DICOM Query/Retrieve SCP supports hierarchical queries with all mandatory search keys. The following four tables describe the search keys for the four levels of query that the SCP supports.

Patient level attributes

Attribute name	Tag	Usage SCU/SCP	Note
Patient name	(0010,0010)	M/M	max. length 25
Patient id[a]	(0010,0020)	M/M	max. length 12
Patient's Birth Date	(0010,0030)	U/U	
Patient's Sex	(0010,0040)	U/U	
No.of Pat.Rel.Studies	(0020,1200)	U/U	
No.of Pat.Rel.Images	(0020,1204)	U/U	

a. in a SOMARIS/4 system the patient id must be a definte identification in the patient data base. In the other case a find may be not definite.

Study level attributes

Attribute name	Tag	Usage SCU/SCP	Note
Study instance UID	(0020,000D)	M/M	
Study id	(0020,0010)	M/M	
Study date	(0008,0020)	M/M	
Study time	(0008,0030)	M/M	
Accession number	(0008,0050)	M/M	only defined when registered by RIS

Series level attributes			
Attribute name	**Tag**	**Usage SCU/SCP**	**Note**
Series instance UID	(0020,000E)	M/M	
Series number	(0020,0011)	M/M	
Modality	(0008,0060)	M/M	

Image level attributes			
Attribute name	**Tag**	**Usage SCU/SCP**	**Note**
SOP instance UID	(0008,0018)	M/M	
Image number	(0020,0013)	M/M	
Acquisition	(0020,0012)	U/U	
Acquisition Date	(0008,0022)	U/U	
Acquisition Time	(0008,0032)	U/U	
Slice Location	(0020,1041)	U/U	

The Find SCP returns following status codes:

C-FIND return status

Service Status	Meaning	Protocol Codes	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

Real World Activity – Get SCP

not applicable

Real World Activity – Move SCP

Associated Real-World Activity – Move SCP

The associated Real-World activity is to respond to retrieve requests to an SCU. The SCP supports the query model Patient Root and Patient/Study Only. The Storage Service Class Conformance Statement describes the C-STORE service which is generated by the C-MOVE service.

Proposed Presentation Contexts – Move SCP

The SIEMENS SOMATOM DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended
Name	**UID**	**Name List**	**UID List**		**Negotiation**
Patient Root Query/ Retrieve Move	1.2.840.10008.5.1.4.1.2.1.2	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCP	See Note
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2		
Patient/Study Only Query/ Retrieve Move	1.2.840.10008.5.1.4.1.2.3.2	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCP	See Note
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2		

NOTE

C-Move Extended Negotiation will be supported by the SCP.

SOP Specific Conformance Statement - Move SCP

At association establishment time the C-MOVE presentation context shall be negotiated. The C-STORE sub-operation is used on a different second association, specified in the C-MOVE request, to transfer images to the Storage-SCP.

The Move SCP returns following status codes:

C-MOVE return status

Service Status	Meaning	Protocol Codes	Related Fields
Refused	Out of Resources - Unable to calculate number of matches	A701	(0000,0902)
	Out of Resources - Unable to perform suboperations	A702	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
Failed	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Sub-operations terminated due to Cancel Indication	FE00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	Sub-operations Complete - One or more Failures or Warnings	B000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	Sub-operations are continuing	FF00	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Success	Sub-operations Complete - No Failures or Warning	0000	(0000,1020) (0000,1021) (0000,1022) (0000,1023)

CHAPTER B.3

Communication Profiles

Supported Communication Stacks

The SIEMENS SOMATOM DICOM application provide DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

OSI Stack

not supported.

TCP/IP Stack

The SIEMENS SOMATOM DICOM application uses the TCP/IP stack from the SUN-OS Version 4.13 system upon which it executes. It uses the MergeCOM subroutine library that is based on a Berkeley socket interface.

API

The SIEMENS SOMATOM DICOM application uses the MergeCOM library that is based on a TCP/IP socket interface.

Physical Media Support

The SIEMENS SOMATOM DICOM application is indifferent to the physical medium over which TCP/IP executes; it inherits this from the SUN-OS system upon which it executes.

Point-to-Point Stack

not supported.

CHAPTER B.4

Extensions/Specializations/ Privatizations

Standard Extended/Specialized/ Private SOPs

not applicable

Private Transfer Syntaxes

not applicable

SOMARIS/4 Specifics

- For 'Find' from an external user the seperators ' ',',' and '^' are mapped to '?'. As attribute matching the 'single value matching' and 'wild card matching' is implemented.
- When a external dataset is move to the SOMARIS/4 data base it gets the dataset modality identification (0008,0060) 'CT'.
- The patient name is shortened to 25 characters, the identification is shortened to 12 characters.
- In SOMARIS/4 studies and series are handled concerning DICOM. When a new patient is registered, a new study is created. Series are created within the examination when measurement parameters are changed.
- An accession number is created when the patient is registered (0008,0050). When ISI Gateway is connected the ISI Gateway Case id is mapped to the accession number.
- Slice Position and Table location (20,50) are handled identically.
- The Study Instance UID, Series Instance UID and SOP Instance UID are build in the following way: 1.3.12.2.1107.5.1.1.seriesnumber.datetimefraction.level'

Attribute Matching

The following table gives an overview about the SCU and SCP attribute matching

Description	Tag	Matching SCU	Matching SCP
Patient's Name	(0010,0010)	suw	suw
Patient ID	(0010,0020)	suw	suw
Patient's Birth Date	(0010,0030)	-	sur
Patient's Sex	(0010,0040)	-	su
No. of Pat. Rel. Studies	(0020,1200)	-	-
No. of Pat. Rel. Images	(0020,1204)	-	-
Study Date	(0008,0020)	-	sur
Study Time	(0008,0030)	-	sur
Accession Number	(0008,0050)	-	su
Study ID	(0020,0010)	-	su
Study Instance UID	(0020,000D)	u	sul
Modality	(0008,0060)	-	su
Series Number	(0020,0011)	-	su
Series Instance UID	(0020,000E)	u	sul
Image Number	(0020,0013)	sur	su
SOP Instance UID	(0008,0018)	u	sul
Acquisition	(0020,0012)	u	su
Acquisition Date	(0008,0022)	u	sur
Acquisition Time	(0008,0032)	u	sur
Slice Position	(0020,1041)	u	su

s: Single Value Matching; u: Universal Matching; r: Range Matching; l: List of UID Matching; w: Wildcard Matching

CHAPTER

B.5 Configuration

The Application Entity Titles, host names and port numbers are configured using the SIEMENS SOMARIS/4 installation tool.

AE Title / Presentation Address Mapping

The SOMARIS/4 DICOM Query/Retrieve unique application entity title is assigned using the following mechanism:
e.g. each application entity title starts with a unique 10 character string assigned for the local SIEMENS SOMATOM DICOM node. This string is also used as the first 10 characters of the PACSnet Logical Address (PLA) and builds the AEroot. An example for such a string is '049SA1CT01'. The AE suffix is the 4 character string **DQRY** (DICOM Query/Retrieve).

SOMARIS/4 uses for DICOM Query/Retrieve SCP:
- ❏ the DICOM Application Entity title: <AEroot>DQRY
- ❏ and the port number 50089

SOMARIS/4 uses for DICOM Query/Retrieve SCU:
- ❏ the DICOM Application Entity title: <AEroot>DQRU
- ❏ and the port number 50089

SOMARIS/4 uses for DICOM Storage SCP:
- ❏ the DICOM Application Entity title: <AEroot>DIC1
- ❏ and the port number 50082

SOMARIS/4 DICOM Storage SCU provides
- ❏ the DICOM Application Entity Title <AEroot>DFOS
- ❏ and the port number 50082

Default Parameters

The application also uses some default parameters:

- ❏ max PDU size set to 16384 Bytes (16 kB)
- ❏ time-out for accepting/rejecting an association request: 60 s
- ❏ time-out for responding to an association open/close request: 60 s
- ❏ time-out for accepting a message over network: 60s

CHAPTER B.6

Support of Extended Character Sets

The SIEMENS SOMATOM DICOM application supports the ISO 8859 Latin 1 (ISO-IR 100) character set.

PART C

DICOM Basic Print

C.1 *Implementation Model*

Application Data Flow Diagram C.1–2

Functional Definitions of Application Entities C.1–3

Sequencing of real World Activities C.1–5

C.2 *Application Entity Specifications*
Print Management AEs Specification

Basic Grayscale Print Management META SOP Classes C.2–2

Basic Print Management SOP Classes Description C.2–3

Basic Film Session SOP class C.2–4

Basic Film Box SOP class C.2–5

Basic Greyscale Image Box SOP Class C.2–8

Printer SOP Class C.2–10

Association Establishment Policies C.2–11

General C.2–11

Number of Associations C.2–11

Asynchronous Nature C.2–11

Implementation Identifying Information C.2–11

Association Initiation Policy C.2–12

Associated Real World Activity C.2–12

C.3 *Communication Profiles*

Supported Communication Stacks C.3–1

OSI Stack C.3–1

TCP/IP Stack C.3–1

Point-to-Point Stack C.3–1

C.4 *Extensions/Specializations/Privatizations*

Standard Extended/Specialized/Private SOPs C.4–1

Private Transfer Syntaxes C.4–2

C.5 *Configuration*

AE Title / Presentation Address Mapping C.5–1

Configurable Parameters C.5–2

C.6 *Support of Extended Character Sets*

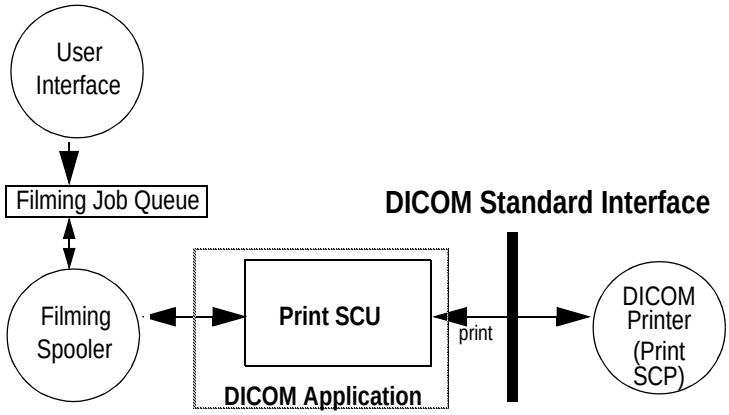
CHAPTER C.1

Implementation Model

The print management service classes define an application-level class of services which enable the printing of images on a hardcopy medium. The print management SCU and print management SCP are peer DICOM print management application entities. The SOMARIS/4 DICOM basic print application supports the print management DIMSE services to act as SCU.

Application Data Flow Diagram

The SOMARIS/4 DICOM network implementation is a UNIX application and acts as SCU for the print managment network service.



Functional Definitions of Application Entities

The SOMARIS/4 DICOM Basic Print application enables the usage of DICOM Basic Print services instead of SPDI/ SPCI-cameras. The following features are available:

- ❏ In service mode the user can define camera-specific parameters such as film size, orientation, division and maximal density and minimal density.
- ❏ Also a lookup table can be selected, which is integrated in the transformation of pixel values to gray scale (modality lookup table).
- ❏ To achieve optimum image quality it is necessary that the camera implements a linear system in the range of density from 0.2 to 2.8.
  On the other hand service can select or create an additional lookup table to adapt a nonlinear camera system or achieve another impression.
- ❏ User functions are Filming/Setting (select documentation features), Filming/Interactive (expose the displayed image), Filming/List (expose images from a directory list), Filming/ Jobcontrol (get an overview of done and pending jobs).
- ❏ Selected images are allocated to film jobs. Jobs are spooled and transmitted to the camera by the Print SCU.
- ❏ Before an image will be transferred to camera, image pixels are translated to an eight bit grey scale image in accordance with user windowing and selected lookup table (modality LUT transformation). Also image text and graphics are included.
- ❏ The size of images transferrred to camera is 512 by 512 always.
- ❏ Two pixels are encoded in one word and will be transfered in one word.

- ❏ Images are transmitted to camera in accordance with the DICOM Basic Print standard.
  The SCU invokes a print job and uses the SOP classes of a film session, a film box and image boxes for acquiring all the information which is required for a film session.
  The N - ACTION is used to print the film box.
- ❏ Multiple copy is implemented by repeating Basic Film Box: N - ACTION
- ❏ To do multiple copies the Basic Film Box SOP is repeated.
- ❏ To report asynchronous error messages or warnings from the camera the association between Print SCU and Print SCP is always kept open.
- ❏ After transfer the Film Session is deleted explicitely.

To do the job the following SOP classes are implemented:
- ❏ Basic Film Session SOP class,
- ❏ Basic Film Box SOP class,
- ❏ Basic Grayscale Image Box SOP class
- ❏ Printer SOP class

The following classes are not implemented:
- ❏ Basic Color Image Box SOP class,
- ❏ Reference Image Box class,
- ❏ PostScript Film Session SOP class,
- ❏ VOI LUT Box SOP class,
- ❏ Basic Annotation Box SOP class,
- ❏ Print Job SOP class,
- ❏ Image Overlay Box SOP class.

Sequencing of real World Activities

not applicable

CHAPTER C.2

Application Entity Specifications

Print Management AEs Specification

The print management SCU invokes print management DIMSE services to transfer images from the local AE to the remote SCP AE to print the images with the defined film format and size on a selected network DICOM hardcopy printer. See DICOM part 4 annex H.

Basic Grayscale Print Management META SOP Classes

SOP Class Name	Usage SCU/SCP
Basic Film Session SOP Class	M/M
Basic Film Box SOP Class	M/M
Basic Grayscale Image Box SOP Class	M/M
Printer SOP Class	M/M

Basic Print Management SOP Classes Description

SIEMENS SOMARIS/4 DICOM products provide Standard Conformance to the following DICOM V3.0 Basic Print Management SOP Classes as an SCU:

SOP Class Name	SOP Class UID
Basic Film Session SOP Class	1.2.840.10008.5.1.1.1
Basic Film Box SOP Class	1.2.840.10008.5.1.1.2
Basic Grayscale Image Box SOP Class	1.2.840.10008.5.1.1.4
Printer SOP Class	1.2.840.10008.5.1.1.16

Basic Film Session SOP class

The Basic Film Session information object definition describes all the user defined parameter which are common for all the films of a film session. The Basic Film Session refers to one or more Basic Film Boxes and that are printed on one hardcopy printer.

Used DIMSE services

DIMSE Service Element	Usage SCU/ SCP
N-CREATE	M/M
N-DELETE	U/M

Used attributes

mandatory basic film session N-Create attributes

Attribute name	Tag	Usage SCU/SCP	Supported Values
Number of Copies	(2000,0010)	U/M	set by user
Print Priority	(2000,0020)		- n.a.
Medium Type	(2000,0030)		- n.a.
Film Destination	(2000,0040)		- n.a.

Status handling The Basic Film Session SOP class uses following status codes:

Basic Film Session SOP status

Service Status	Meaning	Protocol Codes
Failure	Film session SOP instances hierarchy does not contain film box SOP instances	C600
Failure	Unable to create print job, print queue is full	C601
Failure	Image position collision	C604
Failure	Image size is larger than images box size	C603
Warning	Film session printing is not supported	B601
Warning	Film box does not contain image box (empty page)	B602

Basic Film Session SOP status

Service Status	Meaning	Protocol Codes
Success	Film belonging to the film session are accepted for printing	0000

Basic Film Box SOP class

The Basic Film Box information object definition describes all the user defined parameters of one film of the film session. The Basic Film Box information description defines the presentation parameters which are common for all images on a given sheet of film.

The Basic Film Box refers to one or more Image Boxes.

Used DIMSE services

DIMSE Service Element	Usage SCU/ SCP
N-CREATE	M/M
N-ACTION	M/M

Used attributes

Mandatory Film Box N-CREATE attributes

Attribute name	Tag	Usage SCU/SCP	Supported Values
Image Display Format	(2010,0010)	M/M	(1)
Referenced Film Session Sequence	(2010,0500)	M/M	(2)
>Referenced SOP Class UID	(0008,1150)	M/M	(3)
>Referenced SOP Instance UID	(0008,1155)	M/M	(3)
Referenced Image Box Sequence	(2010,0510)	- /M	(2)
>Referenced SOP Class UID	(0008,1150)	- /M	(3)
>Referenced SOP Instance UID	(0008,1155)	- /M	(3)
Referenced Basic Annotation Box Sequence	(2010,0520)	- /M	(2)
>Referenced SOP Class UID	(0008,1150)	- /M	(3)

Mandatory Film Box N-CREATE attributes			
Attribute name	**Tag**	**Usage SCU/SCP**	**Supported Values**
>Referenced SOP Instance UID	(0008,1155)	- /M	(3)
Film Orientation	(2010,0040)	M/M	PORTRAIT, LANDSCAPE
Configuration Information	(2010,0150)	U/M	
Film Size ID	(2010,0050)	M/M	(1) 14IN*17IN 14IN*14IN 11IN*14IN 8IN*10IN
Magnification Type[a]	(2010,0060)	M/M	REPLICATE, BILIENAR, CUBIC
Min Density	(2010,0120)	U/U	(4)
Max Density	(2010,0130)	U/M	(4)

a. on the SOMARIS/4 user interface Magnification Type is named Gradation (sharp:=REPLICATE, medium:=BILINEAR, smooth:=CUBIC)

Mandatory Film Box N-SET attributes			
Attribute name	**Tag**	**Usage SCU/SCP**	**Supported Values**
Magnification Type	(2010,0060)	U/M	see above
Min Density	(2010,0120)	U/U	(4)
Max Density	(2010,0130)	U/M	see above
Configuration information	(2010,0150)	U/M	-

(1) Values for Image Filmsheet Format can be defined by the user. the formats are

STANDARD|c,r	c,r are numbers of columns,rows
ROW\r1,r2	r1,r2 are numbers of image boxes for row 1,2
COL\r1,r2	r1,r2 are numbers of image boxes for colum1,2
SLIDE|c,r	c,r are numbers of columns,rows
SUPERSLIDE|c,r	c,r are numbers of columns,rows

Input of formats is limited to three places, e.g. ROW\3,3,3

(2) sequence of subordinate items
(internal use, evaluated on runtime)

(3) items for internal use, evaluated on the current session

(4) Input of Min Density, Max Density in hundreds of OD, range from 0 ... 999 (user configurable)

Status handling

The Basic Film Box SOP class uses the following status codes:

Basic Film Box SOP status

Service Status	Meaning	Protocol Codes
Failure	Unable to create print job; print queue is full	C602
Failure	Image position collision	C604
Failure	Image size is larger than image box size	C603
Warning	Film box does not contain image box (empty page)	B603
Success	Film accepted for printing	0000

Basic Greyscale Image Box SOP Class

The Basic Greyscale Image Box information object definition is the presentation of an image and image related data in the image area of a film. The Basic Image Box information description describes the presentation parameters and image pixel data which apply to a single image of a sheet of film.

Used DIMSE services

DIMSE Service Element	Usage SCU/ SCP
N-SET	M/M

Used attributes

Mandatory Basic Grayscale Image Box N-SET attributes

Attribute name	Tag	Usage SCU/SCP	Supported Values
Image Position	(2020,0010)	M/M	Dependent on Display Format
Polarity	(2020,0020)	M/M	NORMAL
Preformatted Grayscale Image Sequence	(2020,0110)	M/M	(1)
Samples Per Pixel	(0028,0002)	M/M	(1)
Photometric Interpretation	(0028,0004)	M/M	MONOCHROME2
Rows	(0028,0010)	M/M	512
Columns	(0028,0011)	M/M	512
Pixel Aspect Ratio	(0028,0034)	M/M	1/1
Bits Allocated	(0028,0100)	M/M	8
Bits Stored	(0028,0101)	M/M	8
High Bit	(0028,0102)	M/M	7
Pixel Representation	(0028,0103)	M/M	0000
Pixel Data	(7FE0,0010)	M/M	OB

1) Supported values for Image Film Sheet Format: are

STANDARD|c,r	with c,r are numbers of columns,rows
ROW\r1,r2	with r1,r2 are numbers of image boxes for row 1,2
COL\r1,r2	with r1,r2 are numbers of image boxes for colum1,2
SLIDE|c,r	c,r are numbers of columns,rows
SUPERSLIDE|c,r	c,r are numbers of columns,rows

Input of formats is limited to three places, e.g. ROW\3,3,3

Status handling

The Grayscale Image Box SOP class uses the following status codes:

Basic Grayscale Image Box SOP status

Service Status	Meaning	Protocol Codes
Failure	Insufficient memory in printer to store the image	C605
Success		0000

Printer SOP Class

The Printer SOP Class is the possibility to monitor the status of the hardcopy printer in a synchronous and an asynchronous way.

Used attributes

The SCU uses the mandatory N-EVENT Report DIMSE service to monitor the changes of the printer status in an asynchronus way.

Used DIMSE services

DIMSE Service Element	Usage SCU/ SCP
N-EVENT-REPORT	M/M
N-GET	U/M

Mandatory Printer N-EVENT report

Event type name	Event	Attributes	Tag	Usage SCU/SCP
Normal	1			
Warning	2	Printer Status Info	(2110,0020)	U/M
Failure	3	Printer Status Info	(2110,0020)	U/M

The N-GET Report DIMSE service is mandatory for the SCP and is used to get information from the hardcopy printer.

Mandatory Printer N-GET attributes

Attribute name	Tag	Usage SCU/SCP
Printer Status	(2110,0010)	U/M
Printer Status Info	(2110,0020)	U/M

Association Establishment Policies

General

The configuration of the Siemens SOMARIS/4 DICOM Basic Print management SCU defines the Application Entity Titles, the port numbers and of course the host name and net address.

Number of Associations

The Siemens SOMARIS/4 DICOM application initiates one association at a time, one for each transfer request being processed.

Asynchronous Nature

The Siemens SOMARIS/4 DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

Implementation Identifying Information

The Siemens SOMARIS/4 DICOM software provides a single Implementation Class UID of

❏ "1. 3.12.2.1107.5.1.1"

and an Implementation Version Name of

❏ “SiemensSOM4_VB41”.

Association Initiation Policy

The Print Management SCU and SCP establish an association by using the DICOM association services. During association establishment the Print Managment application entities negotiates the supported SOP classes to exchange the capabilities of the SCU and the SCP.

The association is kept open to report asynchronous error messages.

The association is closed also if the user switches to an other camera.

Associated Real World Activity

Associated Real World Activity

The associated Real-World activity is to print over a network a set of images on a film sheet with one or more copies. The images are converted to a proper image size. If the response from the remote application contains a status other than Success the session is aborted.

Proposed Presentation Contexts

The Siemens SOMARIS/4 DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended
Name	**UID**	**Name List**	**UID List**		**Negotiation**
Basic film session SOP class	1.2.840.10008.5.1.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax,	1.2.840.10008.1.2.2		
Basic film box SOP class	1.2.840.10008.5.1.1.2	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax,	1.2.840.10008.1.2.2		
Basic grayscale image box SOP class	1.2.840.10008.5.1.1.4	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax,	1.2.840.10008.1.2.2		

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended
Name	**UID**	**Name List**	**UID List**		**Negotiation**
Printer SOP class	1.2.840.10008.5.1.1.16	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax,	1.2.840.10008.1.2.2		

SOP Specific Conformance Statement *not applicable*

CHAPTER C.3

Communication Profiles

Supported Communication Stacks

The Siemens SOMARIS/4 DICOM application provide DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

OSI Stack

not supported.

TCP/IP Stack

The Siemens SOMARIS/4 DICOM application uses the TCP/IP stack from the SUN-OS system upon which it executes. It uses a subroutine library that is based on a Berkeley socket interface.

API

The Siemens SOMARIS/4 DICOM application uses a library that is based on a TCP/IP socket interface.

Physical Media Support

The Siemens SOMARIS/4 DICOM application is indifferent to the physical medium over which TCP/IP executes; it inherits this from the SUN-OS system upon which it executes.

Point-to-Point Stack

not supported.

CHAPTER C.4

Extensions/Specializations/ Privatizations

Standard Extended/Specialized/ Private SOPs

not applicable

Private Transfer Syntaxes

not applicable

CHAPTER C.5

Configuration

AE Title / Presentation Address Mapping

The SOMARIS/4 DICOM basic print unique application entity title is assigned using the following mechanism:

Each application entity title starts with a unique 10 character string assigned for the local Siemens SOMARIS/4 DICOM node. This string is also used as the first 10 - characters of the PACS-net Logical Address (PLA) and builds the AEroot. An example for such a string is '049SA1CT01'. The AE suffix is the 4 character string DBPR (DICOM Basic Print).

SOMARIS/4 uses for DICOM Basic Print SCU:

- the DICOM Application Entity title: <AEroot>DBPR
- and the port number 60010

Configurable Parameters

The Application Entity Titles, host names and port numbers are configured using the Siemens SOMARIS/4 installation tool.

This installation tool also uses some default parameters:

- ❏ max PDU size set to 16384 Bytes (16 kB)
- ❏ time-out for accepting/rejecting an association request: 60 s
- ❏ time-out for responding to an association open/close request: 60 s
- ❏ time-out for accepting a message over network: 120 s

Pixel Representation for Special Need

The pixel representation is described in "DICOM Change Proposal -14 for PS 3.5 Pixel Data Encoding Clarification". In SOMARIS/4 the pixel representation is implemented. concerning this proposal. Because SOMARIS/4 runs on a big endian machine (SUN) the pixel order is 1-0-3-2-5-4... To get the order 0-1-2-3-4-5 for special need it can be triggered by the environment **EXPO_DICOMBP_NOBYTESWAB**. It must be inserted in the startup file ~somaris/.envvar_ct. This is a change in the regular released software, it must be protocolled and tested carefully. Changes are overwritten with the next software update.

- ❏ If environment is not defined, pixel representation is in the way as descripted by DICOM proposal.
- ❏ If the environment is defined the order is byte representation.

CHAPTER C.6

Support of Extended Character Sets

The SIEMENS SOMATOM DICOM application supports the ISO 8859 Latin 1 (ISO-IR 100) character set.

PART D

DICOM Work List

D.1 *Implementation Model*

Application Data Flow Diagram D.1–2

Functional Definitions of Application Entities D.1–3

Sequencing of real World Activities D.1–4

D.2 *Application Entity Specifications*
Modality Worklist Service AEs Specification

Association Establishment Policies D.2–2

General D.2–2

Number of Associations D.2–2

Asynchronous Nature D.2–2

Implementation Identifying Information D.2–2

Association Initiation Policy D.2–3

Real World Activity D.2–3

D.3 *Communication Profiles*

Supported Communication Stacks D.3–1

OSI Stack D.3–1

TCP/IP Stack D.3–1

Point-to-Point Stack D.3–1

D.4 *Extensions/Specializations/Privatizations*

Standard Extended/Specialized/Private SOPs D.4–1

Private Transfer Syntaxes D.4–2

SOMARIS/4 Specifics D.4–3

D.5 *Configuration*

AE Title / Presentation Address Mapping D.5–1

Configurable Parameters D.5–2

D.6 *Support of Extended Character Sets*

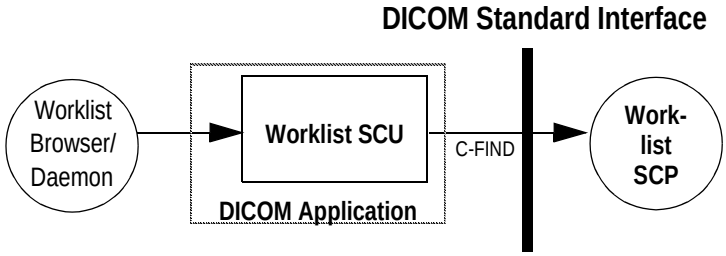
CHAPTER D.1

Implementation Model

The worklist service class defines an application-level class of service which facilitates the transfer of worklists from the information system to the imaging modality. The worklist is queried by the AE and supplies the SCU with the scheduled tasks which have to be performed on the modality. The SOMARIS/4 DICOM worklist application supports the worklist service to act as SCU.

Application Data Flow Diagram

The SOMARIS/4 DICOM network implementation is a UNIX application and acts as SCU for the worklist network service.



Functional Definitions of Application Entities

The worklist SCU requests the worklist SCP to perform a match to the keys specified in the C-Find DIMSE service.

The worklist SCP responses to the C-FIND query and scheduled imaging service requests and patient demographic information will be downloaded from the information system to the modality.

All components of the SIEMENS SOMATOM DICOM Worklist SCU application operate as background daemon processes. They exist whenever the machine is switched on. If configured SOMARIS/4 queries for worklist. Interval of polling time can be configured.

In the function Patient/Register/Ris the RIS-Patient can be selected for scanning.

Sequencing of real World Activities

not applicable

CHAPTER D.2

Application Entity Specifications

Modality Worklist Service AEs Specification

The worklist SCU requests that the remote SCP performs a match of all keys specified in the query against the information in its worklist database.

SIEMENS SOMARIS/4 DICOM products provide Standard Conformance to the following DICOM V3.0 SOP Class as an SCU:

SOP Class Name	SOP Class UID
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31

Association Establishment Policies

General

The configuration of the Siemens SOMARIS/4 DICOM worklist application defines the Application Entity Titles, the port numbers and of course the host name and net address.

Number of Associations

The Siemens SOMARIS/4 DICOM application initiates one association at a time, one for each transfer request being processed.

Asynchronous Nature

The Siemens SOMARIS/4 DICOM software does not support asynchronous communication (multiple outstanding transactions over a single association).

Implementation Identifying Information

The Siemens SOMARIS/4 DICOM software provides a single Implementation Class UID of

❏ 1.3.12.2.1107.5.1.1

and an Implementation Version Name of

❏ e.g. “SiemensSOM4_VB41”.

Association Initiation Policy

The modality worklist SCU establish an association by using the DICOM association services. During association establishment the negotiation of SOP classes to exchange the capabilities of the SCU and the SCP is not supported.

The following DIMSE-C operation is supported as SCU:

❑ C-FIND

Real World Activity

Associated Real-World Activity

The associated Real-World activity is to initate query requests to an SCP by using the DICOM Worklist Information Model.

Proposed Presentation Contexts

The Siemens SOMARIS/4 DICOM application will propose Presentation Contexts as shown in the following table:

Presentation Context Table

Abstract Syntax		Transfer Syntax		Role	Extended
Name	**UID**	**Name List**	**UID List**		**Negotiation**
Modality Worklist Information Model-FIND	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
		DICOM Explicit VR Big Endian Transfer Syntax	1.2.840.10008.1.2.2		

SOP Specific Conformance Statement

Search Key Attributes of the Worklist C-FIND

The Siemens SOMARIS/4 DICOM worklist SCU supports worklist queries with all required search keys. The following 'Tabelle 4' describe the search keys that the SCU supports: Column 'SOM/4' with mark 'req'.

Return Key Attributes of the Worklist C-FIND

The Siemens SOMARIS/4 DICOM worklist SCU supports worklist queries. The following 'Tabelle 4' describes the return keys which are supported by SOMARIS/4 and are shown in the RIS platform: Column 'SOM/4' with mark 'rsp'.

SOMARIS/4 Image Header Elements from Worklist

DICOM worklist elements are tranferred to image header. The following 'Tabelle 4' describes these header elements which are overtaken from worklist: Column 'SOM/4' with mark 'tra'.

Attribute Name	Tag	Matching Key Code	Re-turn Key Code	Attribute Description	SOM/4
SOP Common Modality Worklist Infromation Model Find UID Name 1.2.840.10008.5.1.4.31					
Specific Character Set	(0008,0005)	O	1C	Character Set that expands or replaces the Basic Graphic Set. Required if an expanded or replacment character set is used This Attribute is required if expanded or replacement characters are used.	

Attribute Name	Tag	Matching Key Code	Re-turn Key Code	Attribute Description	SOM/4
Scheduled Procedure Step					
Scheduled Procedure Step Sequence	(0040,0100)	R	1	The Attributes of the Scheduled Procedure Step shall only be retrieved with Sequence Matching. The Scheduled Procedure Step Sequence shall contain only a single Item.	req rsp
> Scheduled Station AE title	(0040,0001)	R	1	The Scheduled station AE title shall be retrieved with Single Value Matching only.	req rsp
> Scheduled Procedure Step Start Date	(0040,0002)	R	1	Scheduled Step Start Date shall be retrieved with Single Value Matching or Range Matching. see remark under Scheduled Procedure Step Start Time (0040, 0003)	req rsp
> Scheduled Procedure Step Start Time	(0040,0003)	R	1	Scheduled Step Start Time shall be retrieved with Single Value Matching or Range Matching. Scheduled Step Start Date and Scheduled Step Start Time are subject to Range Matching. If both keys are specified for Range Matching, e.g. the date range "July 5–July 7" and the time range "10am–6pm" specifies the time period strating on July 5, 10am until July 7, 6pm. Note: If the Information System does not provide scheduling for individual Procedure Steps, it is allowed to use the closest scheduling information it possesses (e.g. Procedures are subject to scheduling instead of Procedure Steps).	req rsp

Attribute Name	Tag	Matching Key Code	Re-turn Key Code	Attribute Description	SOM/4
> Modality	(0008,0060)	R	1	Type of equipmemt that acquired the data used to create the images in this Study Component The Modality shall be retrieved with Single Value Matching.	req
> Scheduled Performing Physician's Name	(0040,0006)	R	2	Scheduled Performing Physician's Name shall be retrieved with Single Value Matching or Wild Card Matching.	
> Scheduled Procedure Step Description	(0040,0007)	O	1C	Either the Scheduled Procedure Step Description (0040,0007) or the Scheduled Action Item Code Sequence (0040,0008) or both shall be supported by the SCP.	
> Scheduled Station Name	(0040,0010)	O	2	An institutinn defined name for the modality on which ths Scheduled Procedure Step is scheduled to be performed.	rsp
> Scheduled Procedure Step Location	(0040,0011)	O	2	The location at which the Procedure Step is scheduled to be performed.	rsp
> Scheduled Action Item Code Sequence	(0040,0008)	O	1C	Either the Scheduled Procedure Step Description (0040,0007) or the Scheduled Action Item Code Sequence (0040,0008) or both shall be supported by the SCP. The Scheduled Action Item Code Sequence contains one or more Action Items	
>> Code Value	(0008,0100)	O	1C	Required if aSequence Item is present.	
>> Coding Scheme Designator	(0008,0102)	O	1C	Required if a Sequence Item is present.	
>> Code Meaning	(0008,0104)	O	3		

Attribute Name	Tag	Matching Key Code	Re-turn Key Code	Attribute Description	SOM/4
> Pre-Medication	(0040,0012)	O	2C	The value of Pre-Medication Attribute is to be returned, when Pre-Medication is to be applied to that Scheduled Procedure Step.	
> Schedueled Procedure Step ID	(0040,0009)	O	1		
> Comments on the Scheduled Procedure Step	(0040,0400)	O	3	User-defined comments on the Scheduled Procedure Step.	
> Requested Contrast Agent	(0032,1070)	O	1C	The value of the Requested Contrast Agent Attribute is to be returned, when Constrast Media is to be applied to that Scheduled Procedure Step.	

Attribute Name	Tag	Matching Key Code	Re-turn Key Code	Attribute Description	SOM/4
Requested Procedure					
Requested Procedure ID	(0040,1001)	O	1	Identifier which identifies the Requested Procedure in the Imaging Service Request.	rsp tra
Requested Procedure Description	(0032,1060)	O	1C	Instituion-generated descriptor or classification of requested procedure The Requesetd Procedure Description (0032,1060) or the Requested Procedure Code Sequence (0032,1064) or both shall be supported by the SCP.	
Requested Procedure Code Sequence	(0032,1064)	O	1C	A sequence that conveys the requesetd procedure The Requesetd Procedure Description (0032,1060) or the Requested Procedure Code Sequence (0032,1064) or both shall be supported by the SCP. The Requested Procedure Code Sequence shall only contain a single Item.	
> Code Value	(0008,0100)	O	1C	Required if a Sequence Item is present.	
> Coding Scheme Designator	(0008,0102)	O	1C	Required if a Sequence Item is present.	
> Code Meaning	(0008,0104)	O	3		

Attribute Name	Tag	Matching Key Code	Re-turn Key Code	Attribute Description	SOM/4
Study Instance UID	(0020,000D)	O	1	Unique Identifier for a study	rsp tra
Referenced Study Sequence	(0008,1110)	O	2	Uniquely identifies the Study SOP Instance that associated with the Results SOP Instance	
> Referenced SOP Class UID	(0008,1150)	O	1C	Uniquely identifies the referenced SOP class Reaquired if a Sequence Item is present.	
> Referenced SOP Instance UID	(0008,1155)	O	1C	Uniquely identifies the referenced SOP instance Reaquired if a Sequence Item is present.	
Requested Procedure Priority	(0040,1003)	O	2		
Patient Transport Arrangements	(0040,1004)	O	2		

Attribute Name	Tag	Matching Key Code	Re-turn Key Code	Attribute Description	SOM/4
Imaging Service Request					
Accession Number	(0008,0050)	O	2	A RIS generated number which identifies the order for the Study.	rsp tra
Requesting Physican	(0032,1032)	O	2		
Referring Physician's Name	(0008,0090)	O	2	Patient's primary referring physician for this visit	rsp tra
Visit Identification					
Admission ID	(0038,0010)	O	2		
Visit Status					
Current Patient Location	(0038,0030)	O	2		
Visit Relationship					
Referenced Patient Sequence	(0008,1120)	O	2	Uniquely identifies the Patient SOP Instances that relates to the Study SOP Instance	
> Referenced SOP Class UID	(0008,1150)	O	2	Uniquely identifies the referenced SOP Class	
> Referenced SOP Instance UID	(0008,1155)	O	2	Uniquely identifies the referenced SOP Instance	
Visit Admission					

Attribute Name	Tag	Matching Key Code	Re-turn Key Code	Attribute Description	SOM/4
Patient Relationship					
All Attributes		O	3		
Patient Identification					
Patient's Name	(0010,0010)	R	1	Patient's full legal name Patient Name shall be retrieved with Single Value Matching or Wild Card Matching.	rsp tra
Patient ID	(0010,0020)	R	1	Primary hospital identification number or code for the patient Patient ID shall be retrieved with Single Value Matching or Wild Card Matching.	rsp tra
All other Attributes		O	3		
Patient Demographic					
Patient's Birth Date	(0010,0030)	O	2	Patient's Birth Date	rsp tra
Patient's Sex	(0010,0040)	O	2	Patient's Sex	rsp tra
Patient's Weight	(0010,1030)	O	2		
Confidentially constraint on patient data	(0040,3001)	O	2		
All other Attributes		O	3		

Attribute Name	Tag	Matching Key Code	Re-turn Key Code	Attribute Description	SOM/4
Patient Medical					
Patient State	(0038,0500)	O	2		
Pregnancy Status	(0010,21C0)	O	2		
Medical Alerts	(0010,2000)	O	2		
Contrast Allergies	(0010,2110)	O	2		
Special Needs	(0038,0050)	O	2		
All other Attributes		O	3		

Status Codes of the Worklist C-FIND

The worklist SCU interprets following status codes:

Service Status	Meaning	Status Codes (0000,0900)	Related Fields
Refused	Out of Resources	A700	(0000,0902)
Failed	Identifier does not match SOP Class	A900	(0000,0901) (0000,0902)
	Unable to process	Cxxx	(0000,0901) (0000,0902)
Cancel	Matching terminated due to Cancel request	FE00	None
Success	Matching is complete - No final Identifier is supplied	0000	None
Pending	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys	FF00	Identifier
	Matches are continuing - Warning that one or more Optional Keys were not supported for existence and/or matching for this identifier	FF01	Identifier

CHAPTER D.3

Communication Profiles

Supported Communication Stacks

The Siemens SOMARIS/4 DICOM application provide DICOM V3.0 TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard.

OSI Stack

not supported.

TCP/IP Stack

The Siemens SOMARIS/4 DICOM application uses the TCP/IP stack from the SUN-OS/Solaris system upon which it executes. It uses the MergeCOM-3 subroutine library from Merge Technologies Inc. that is based on a Berkeley socket interface.

API

The Siemens SOMARIS/4 DICOM application uses the MergeCOM library that is based on a TCP/IP socket interface.

Physical Media Support

The Siemens SOMARIS/4 DICOM application is indifferent to the physical medium over which TCP/IP executes; it inherits this from the SUN-OS system upon which it executes.

Point-to-Point Stack

not supported.

CHAPTER D.4

Extensions/Specializations/ Privatizations

Standard Extended/Specialized/ Private SOPs

not applicable

Private Transfer Syntaxes

not applicable

SOMARIS/4 Specifics

- ❏ As attribute matching the ’single value matching’ and ’wild card matching’ is implemented.
- ❏ The patient name is shortened to 25 characters, the patient ID is shortened to 12 characters.

CHAPTER D.5

Configuration

AE Title / Presentation Address Mapping

The SOMARIS/4 DICOM worklist unique application entity title is assigned using the following mechanism:

e.g. each application entity title starts with a unique 10 character string assigned for the local Siemens SOMARIS/4 DICOM node. This string is also used as the first 10 characters of the PACSnet Logical Address (PLA) and builds the AEroot. An example for such a string is '049SA1CT39'. The AE suffix is the 4 character string DBWM (DICOM Modality Worklist).

The DICOM Modality Worklist application provides the application entity title:

SOMARIS/4 uses for DICOM Worklist SCU:

- the DICOM Application Entity title: <AEroot>DBWM
- and the port number 60011

Configurable Parameters

The Application Entity Titles, host names and port numbers are configured using the Siemens SOMARIS/4 installation tool.

This installation tool also uses some default parameters:

- ❏ max PDU size set to 16384 Bytes (16 kB)
- ❏ time-out for accepting/rejecting an association request: 60 s
- ❏ time-out for responding to an association open/close request: 60 s
- ❏ time-out for accepting a message over network: 120 s

Worklist for several stations needed:

It is controlled by the environment **DICOM_WL_SCHED_STAT_AET**. It must be inserted in the startup file ~somaris/.envvar_ct. This is a change in the regular released software, it must be protocolled and tested carefully. Changes are overwritten with the next software update.

- ❏ If environment is not defined, the worklist is requested for the own AE only.
- ❏ If the environment is defined but empty, worklist is requested for all possible AEs.
- ❏ If the environment is defined and contents the required AEs as a string, the worklist is requested for defined AEs. E.g. "setenv DICOM_WL_SCHED_STAT_AET station1\\station2\\..."

CHAPTER D.6

Support of Extended Character Sets

The Siemens SOMARIS/4 DICOM application supports the ISO 8859 Latin 1 (ISO-IR 100) character set.

CT

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Bereich Medizinische Technik · Erlangen

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